Muskellunge Management Update

Prepared by

Tim Simonson
Wisconsin Department of Natural Resources
Bureau of Fisheries Management and Habitat Protection
101 S Webster Street, PO BOX 7921
Madison, WI 53707
(608) 266-5222
simont@dnr.state.wi.us

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Muskellunge Management

PURPOSE

The purpose of this report is to provide Department Biologists and anglers with current information on Wisconsin's muskellunge fishery and associated management activities.

MANAGEMENT HISTORY

Muskellunge are found in lakes of all sizes and in slower water of large rivers, generally occupying areas with abundant submerged aquatic plants. The heart of the range is north central Wisconsin, although they are found in many other locations throughout the state; nearly 90% of muskellunge waters occur in the Northern Region. Muskellunge are the largest predatory game fish found in Wisconsin. They are sleek, powerful predators, known to feed on virtually every fish species, as well as aquatic birds and mammals. Because of their large size and predatory nature, muskellunge are usually present at low densities, with most waters generally containing less than 1 adult per acre. Long hours are often required to catch a muskellunge; however, most avid anglers are more than willing to invest the time required to encounter a muskellunge.

Muskellunge are managed as a trophy fish in Wisconsin. This means restricting the harvest through relatively high length limits and low daily bag limits to promote the occurrence of large fish in the population. Only hook and line fishing is allowed for muskellunge. Restrictions on trolling (originally developed to reduce muskellunge harvest) also exist in many waters throughout the state. Fishing regulations for muskellunge are varied, depending upon the growth potential of the population and public support for high length limits. The current statewide minimum length limit is 34", which applies to approximately 73% of all muskellunge waters (see ***Fishing Regulations***, below, for a more detailed breakdown of length limits). The daily bag limit for muskellunge is 1 on all waters statewide except Yellowstone Lake, Lafayette County, where the daily bag limit is 0, and Escanaba Lake, Vilas County, where there is no daily bag limit. The open season for muskellunge north of US Hwy. 10 (Northern Zone) is from the Saturday nearest Memorial Day to November 30, except on Escanaba Lake, Vilas County, which has a continuous open season with no size limit or daily bag limit. The open season south of US Hwy. 10 (Southern Zone) is from the first Saturday in May to November 30, except on Long Lake, Waushara County, which has no open season for muskellunge. A variety of fish refuges designed to protect vulnerable concentrations of spawning muskellunge exist throughout the state. Natural reproduction has always been relatively low and has been presumed to be declining, making stocking an important management strategy in some waters, especially for populations that are dependent on continued stocking.

Resource Base. Muskellunge occur in 711 lakes (615,241 acres) and 83 river segments (1,682 miles). Waters are subjectively divided into three classes based on the relative abundance of muskellunge and the quality of the fishery:

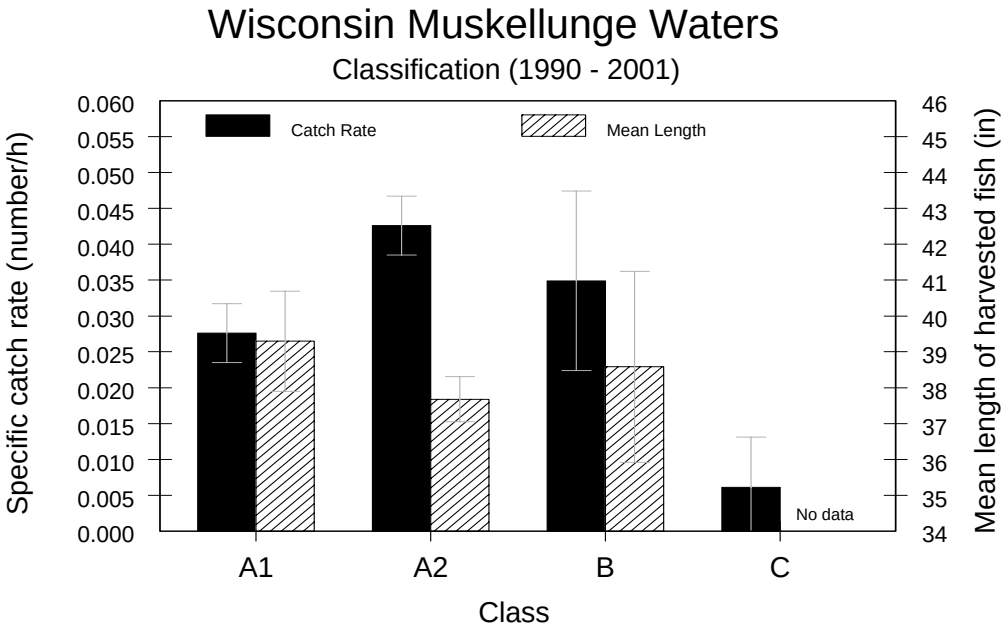
Class A – Support good muskellunge populations and provide the best muskellunge fishing (356 waters; 217,364 acres).

Class A1 – "Trophy waters" (104 waters; 118,173 acres)

Class A2 - "Action waters" (252 waters; 99,191 acres)

Class B – Support intermediate populations that provide good fishing, but with generally lower catch rates than in Class A waters (222 waters; 115,452 acres).

Class C – These waters have fishable muskellunge populations but they are generally not of major importance to the fishery (216 waters; 282,425 acres).



Muskellunge waters are further divided into four categories that described the reproductive status of the muskellunge population:

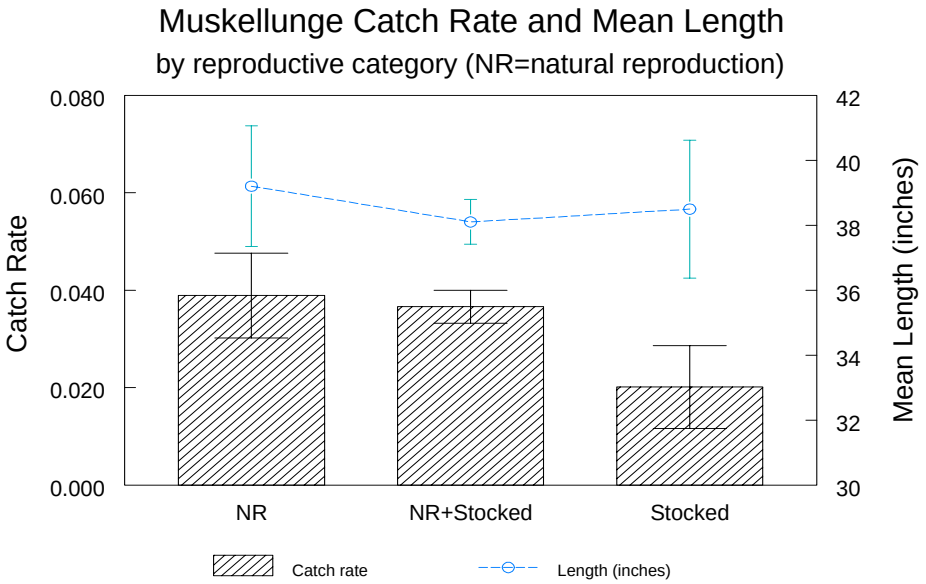
Category 0. Reproductive status unknown (151 waters).

Category 1. Sustained through natural reproduction; no stocking (140 waters).

Category 2. Natural reproduction, but some stocking may occur (364 waters).

Category 3. Stocking is required to maintain the fishery (149 waters).

In general, fishing tends to be better on waters with natural reproduction and little or no stocking, whereas waters totally dependent upon stocking tend to have lower catch rates.



PROGRAM GOALS AND OBJECTIVES

I. Protect and enhance Wisconsin's naturally reproducing (category 1) populations.

A. Identify and protect existing spawning and nursery habitat.

B. Protect the genetic integrity of self-sustained muskellunge populations.

C. Protect adult muskellunge from harvest to full maturity.

II. Manage muskellunge for a variety of unique fishing opportunities (including trophy, quality action, and harvest) within balanced aquatic communities.

A. Trophy Fisheries - Manage Class A1 waters to increase the catch of 50" and larger muskellunge.

B. Action Fisheries - Manage Class A2 waters for a catch rate of 1 muskellunge per 25 hours of muskellunge angling.

C. Improve Existing Fisheries - Rehabilitate former muskellunge waters that have experienced substantial declines in the muskellunge population and improve class B and C fisheries, particularly in southern Wisconsin.

III. Improve the information available for muskellunge populations and educational efforts to inform anglers about the status and management of muskellunge fisheries.

A. Monitoring - Establish a network of long-term trends monitoring waters that track muskellunge abundance, size-structure and relative abundance of the associated fish community. Conduct frequent mail surveys to track angler attitudes and to evaluate program goals. Pilot an Angler Diary program for possible broad-scale coverage.

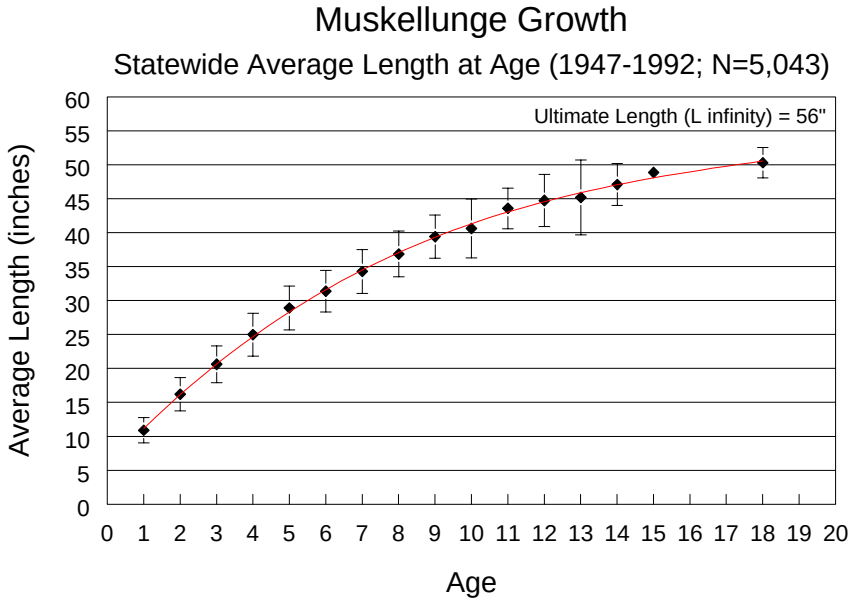
B. Evaluation - 1. Develop an index of natural reproduction. 2. Develop quantitative criteria to define "self-sustained" populations. 3. Implement a comprehensive muskellunge stocking framework to determine relative contribution of stocked fish in Category 2 waters and stocking success in category 3 waters.

C. Education - Continue to focus on the value of catch and release to the fishery - provide technical assistance to partners in their efforts to educate anglers on C&R.

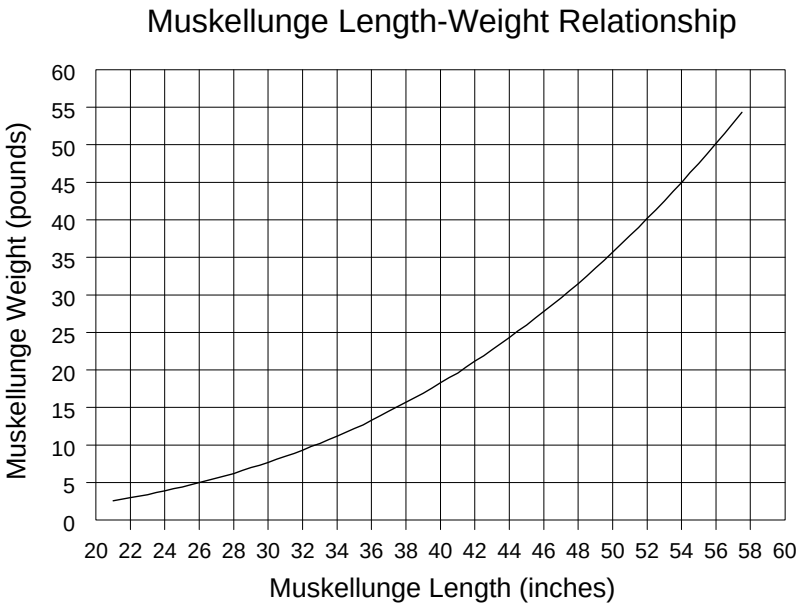
D. Evaluate the reliability and adequacy of existing information from the fishery.

IV. Minimize User conflicts - provide a unique, aesthetic experience.

Muskellunge Growth – The annual growth of muskellunge in Wisconsin is represented on the following graph. On average, muskellunge are about 11 inches long after their first year of life and reach 50 inches by age 17 or 18. Typically, females grow faster than males. Overall, the "ultimate length" attainable by muskellunge in Wisconsin is about 56". This number will be higher for some lakes and lower for others.

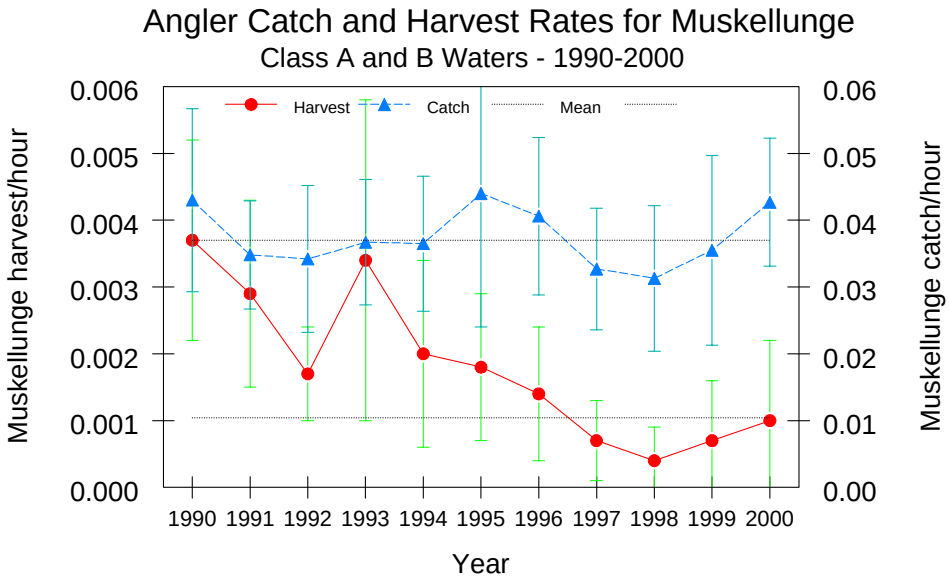


The weight attained by Wisconsin muskellunge of varying lengths is shown on the following graph. On average, muskellunge reach 10 pounds at about 33 inches in length, 20 pounds at about 41 inches, 30 pounds at about 47 inches, and 40 pounds at about 52 inches.

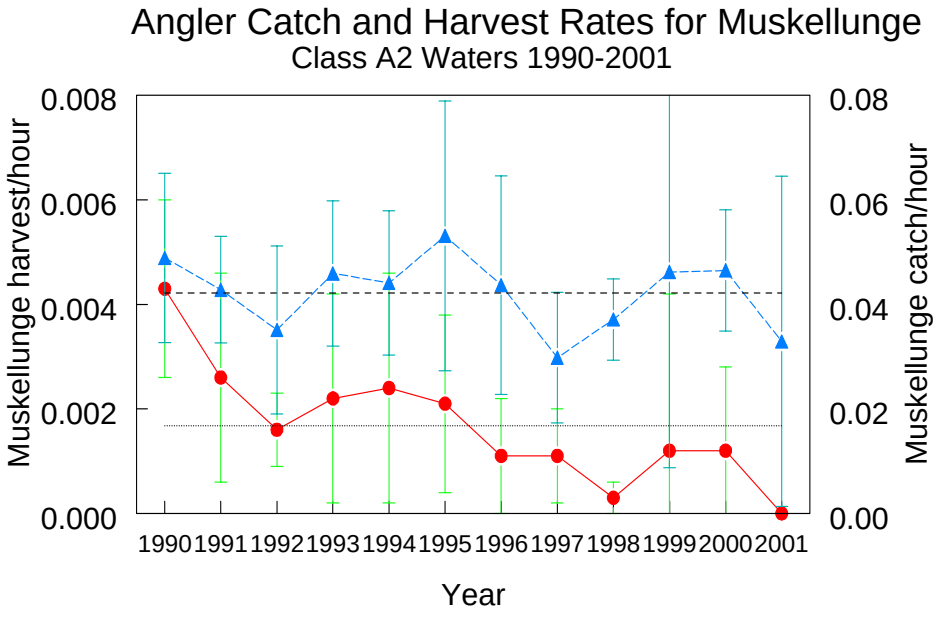


Catch and Harvest. An estimated 360,000 anglers currently pursue muskellunge in Wisconsin, a number that has increased over the years (about 107,000 in 1958, 180,000 in 1965, and 219,000 in 1980).

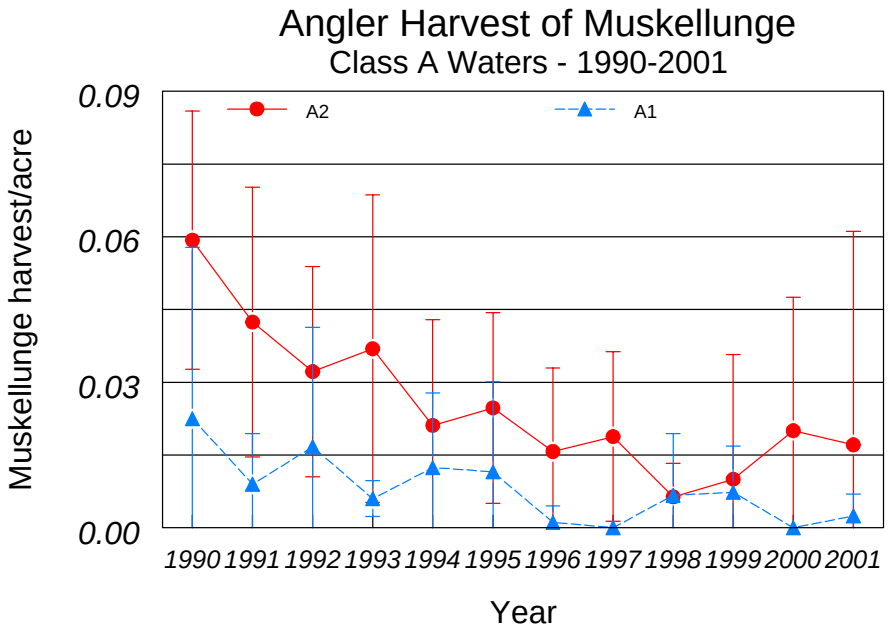
During 2001, the catch rate for muskellunge on all Class A and B waters was 0.032/hour (about 31 hours spent fishing per muskellunge caught), while the harvest rate was 0.001/hour (1000 hours per muskellunge harvested). The 12-year average catch and harvest rates were 0.037/hour (27 hours per fish caught) and 0.0017/hour (580 hours per fish harvested), respectively.



The catch rate on Class A2 ("action") lakes was 0.033/hour (30 hours spent fishing per muskellunge caught). This compares with the long term average of 0.042/hour (24 hours/muskellunge; see Figure below). The estimated harvest rate on Class A2 lakes during 2001 was 0, while the long-term average was 0.002/hour (500 hours per harvested fish).



Overall, angler harvest of muskellunge has declined in Class A waters over the last 20 years. This decrease in harvest is more evident in Class A2 waters, where harvest had typically been higher than in Class A1 waters. Harvest in the early 1980s was estimated at 0.20 muskellunge/acre (Hanson 1986), which was about three times the harvest observed in the early 1990s, and over 20 times the harvest observed in the late 1990s. Total harvest in 2001 was 0.017 muskellunge/acre (17 per 1000 acres) in Class A2 lakes and was 0.0025/acre (2.5 per 1000 acres) in Class A1 lakes. The 12-year averages for Class A2 and Class A1 lakes are 0.025/acre and 0.008/acre, respectively.



Projected Harvest of Muskellunge. The estimated number of muskellunge harvested from Class A waters has declined since 1990, from 8,541 to 1,987 in 2001 (see Table). From 1990 to 2001, the average length of muskellunge harvested was 38 inches (490 fish measured). For comparison, the projected harvest from Class A waters in the early 1980's was 38,318 fish statewide (based on data from Hanson 1986). Total muskellunge harvest during 1957 for all waters (268,882 acres) was estimated as 47,700 based on a license survey (Threinen and Walker 1958).

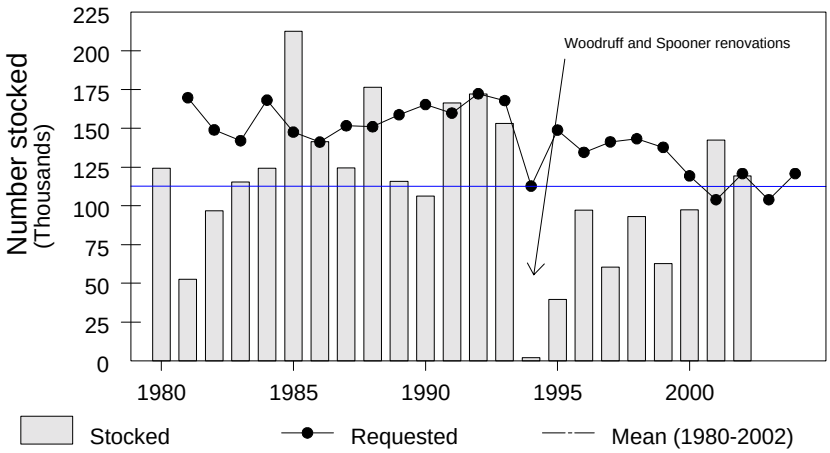
	Year											
Class	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
A1	2659	1064	1973	709	1465	1359	127	0	788	859	0	291
A2	5882	4206	3194	8074	2093	2450	1557	1865	744	992	1984	1696
Total	8541	5270	5167	8783	3558	3809	1684	1865	1532	1851	1984	1987

MANAGEMENT ACTIVITIES

Fish Refuges. No new fish refuges aimed at protecting spawning muskellunge were established or proposed during 1999, 2000, 2001, 2002, or 2003.

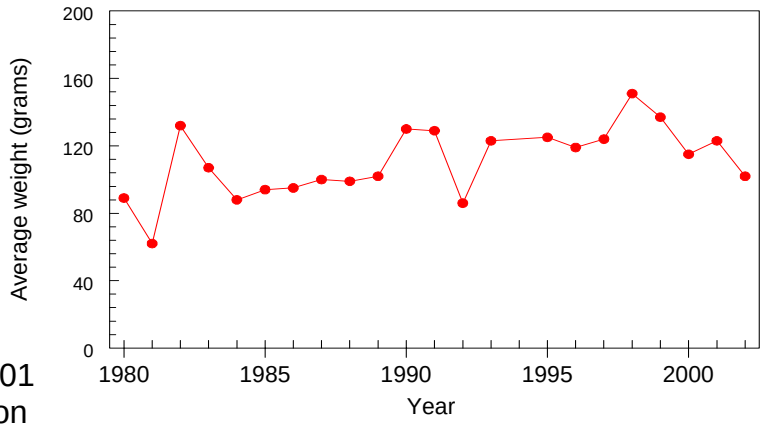
Stocking. Stocking is a prescribed management activity on about 220 muskellunge waters. The typical strategy is to stock 1-2 large (11”+) fingerlings per acre in alternate years to supplement natural reproduction. About half the lakes are stocked in odd years and half in even years.

Muskellunge Stocking (7"+ fingerlings)



A total of 119,265 large fingerlings were stocked in 2002, or 99% of the requested quota. Stocking during 2001 exceeded quota requests by 37% as a result of excellent production; 103,930 were requested and 142,359 were stocked. Requests for stocking of large fingerling muskellunge in 2000 is 119,343. Actual number stocked was 100,401. Stocking of muskellunge during 1999 was well below quota requests. Fisheries Biologists requested 137,799 large fingerling muskellunge for stocking in Wisconsin waters, while 62,731 were actually stocked. Following renovations at the two warm/cool water hatcheries in 1994 (Oehmcke Hatchery, Woodruff) and 1995 (Thompson Hatchery, Spooner), production of muskellunge had been below the long-term average.

Average Size of Stocked Muskellunge Fingerlings
Wisconsin DNR (1980 - present)



The average size of stocked muskellunge has been higher in recent years. These larger muskellunge have a greater chance of surviving than smaller stocked muskellunge.

We implemented a comprehensive muskellunge stocking framework during 2001 in order to determine the relative contribution of stocked fish in Category 2 waters and to evaluate stocking success in Category 3 waters (Appendix Table 1). In addition, some Fisheries Biologists have identified lakes with sufficient natural reproduction where stocking has been reduced or eliminated (Appendix Table 2). The evaluation will consist of establishing long-term stocking goals for the 220 stocked lakes and evaluating them through our monitoring program over the next 10 years.

Summary of waters in the various stocking rates under the current muskellunge stocking plan.

Reproductive status	Stocking rate (number/acre)				
	0	0.5	1	2	Total
Category 1	0*	0	0	0	14*
Category 2	29	42	38	9	118
Category 3	0	27	35	18	80
Category 0	0	0	1	7	8
Total	29*	69	74	34	220

* 14 additional waters have been reclassified as Category 1 waters and would have been removed from the stocking quotas regardless of the development of this framework. Intensive evaluations will be continued on these reclassified waters to ensure that natural reproduction is sufficient to sustain these populations.

Improve existing fisheries. Currently, only 4 (8%) of the 48 waters in the Southern Zone are class A waters (Little Green Lake, Green Lake County; Pewaukee Lake, Waukesha County; Twin Valley Lake, Iowa County; Yellowstone Lake, Lafayette County). Class A2 waters average 415 acres, and are primarily in the northern zone, while class C waters average 1518 acres and class B waters average 620 acres. This inverse relationship between class and status may be related to per-water maximums for stocking, indicating that current stocking levels may be too low to create premier fisheries on stocked waters. Part of the proposed evaluation of our stocking practices will look at stocking rates on class B and C waters that are dependent upon stocking (category 3).

Fishing Regulations. Our overriding goal is to manage muskellunge as a "trophy". What constitutes a trophy varies from angler to angler, based on their personal feelings, and from water to water, based on the biological potential of the population. Our general strategy is to manage muskellunge waters on an individual, water-by-water basis. Within the scientific community, high length limits are generally accepted as the primary tool to manage for trophy muskellunge fisheries. Proposals for higher size limits in Wisconsin must 1) provide biological documentation of the potential for the population to meet the proposed length limit, and 2) must be supported through the public hearing process. Proposals for the 2003 Spring Hearings (effective spring 2004, if supported), include an increase in the minimum length limit to 45" on Lakes Monona, Waubesa, and Wingra, Dane County. Also proposed is an increase to 40" on tributaries upstream from Holcombe Flowage in Taylor, Rusk, and Sawyer Counties for consistency with Holcombe Flowage. A proposal to increase the minimum length limit for muskellunge to 50” on several (38) waters in Vilas and Oneida Counties is also being advanced. Finally, a proposal to eliminate tagging of fish by anglers, unless issued a permit by the Department, will be forwarded.

Effective for the 2003 fishing season, the minimum length limit for muskellunge will be increased from 40" to 50” on Green Bay and Lake Michigan, and from 45" to 50" on Clear Lake, Oneida County. Also, the minimum length limit for muskellunge will be increased to 45” on the Chippewa Flowage, Sawyer County and to 40” on Moose Lake, Sawyer County. Open-water anglers will now be required to remain within 100 yards of their fishing lines at all times. Effective for the 2002 fishing season, the minimum length limit for muskellunge was increased to 45” on Little St. Germain Lake, Vilas County. Also, the minimum length limit was increased to 40” on Buckskin Lake, Oneida County and Sparkling Lake, Vilas County and the length limit was

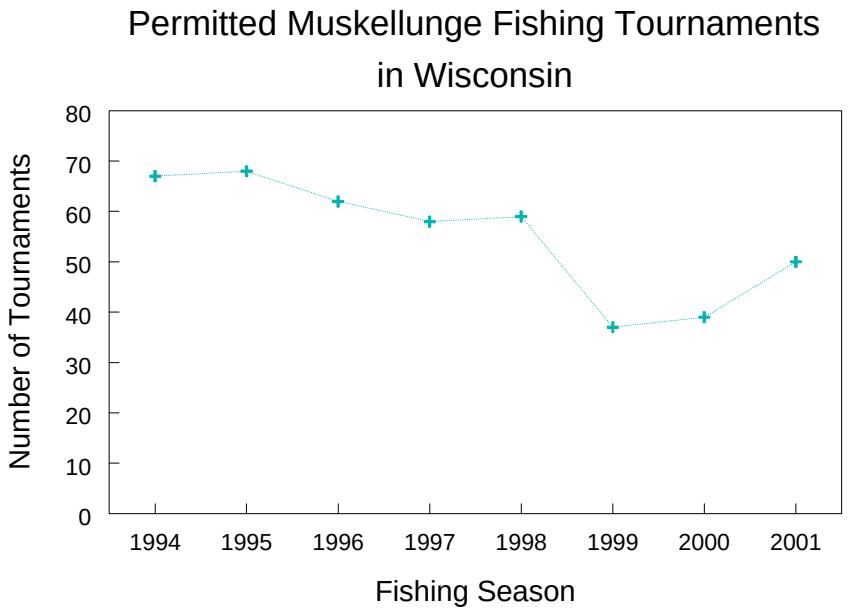
reduced to 28” on Owl Lake, Iron County. Effective with the 2000 fishing season, the minimum length limit for muskellunge was increased from 34” to 40” on Sissabagama Lake, Sawyer County. Also, motor trolling was legalized on all waters in the South Central Region. Effective April 1, 1999, the minimum length limit for muskellunge was increased from 34” to 40” on all waters of St. Croix County (primarily affects 3 waters). The current distribution of lakes among 4 different minimum length limits is shown in the following Table.

Current framework for management of Wisconsin's 794 muskellunge waters (as of March 2003).

Musky Population Status	Minimum length limit	Number of waters	% of Musky waters
High density, slow growing populations, few fish exceed 34"	28"	10	1%
Moderate density, moderate growth populations that are dependent on or supplemented by stocking; most fish able to exceed 34"	34"	576	73%
Good growth and potential for trophies; potential for self-sustained population	40"	196*	25%
Trophy potential, based on growth rates and/or historic information	45"/50"	12	1%

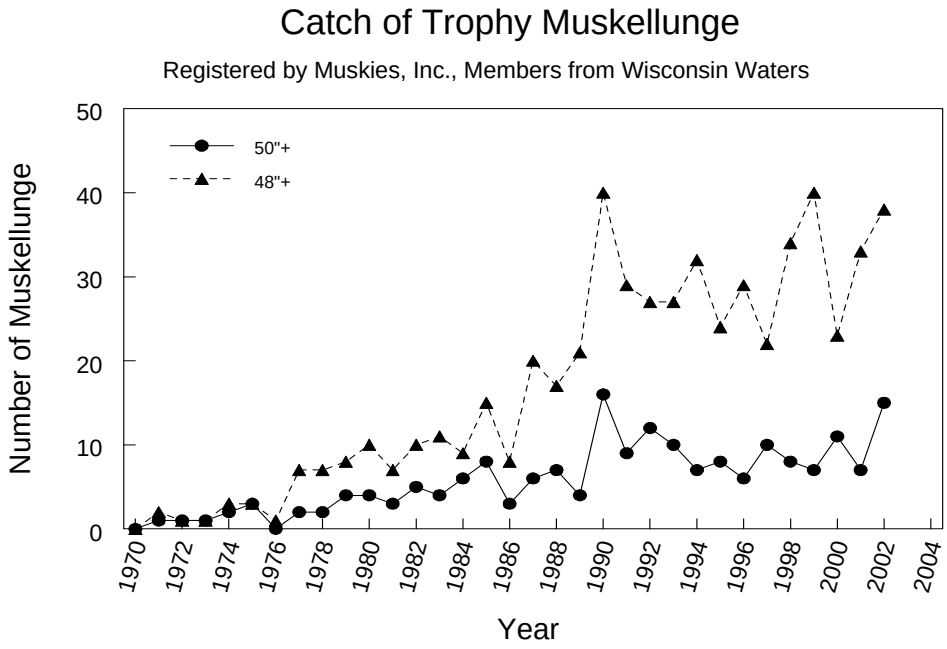
*Includes Little Trout Lake, Shishebogama Lake and 34 muskellunge waters wholly within the Lac du Flambeau Reservation, pursuant to s. NR 20.37; Lake St. Croix, St. Croix and Mississippi Rivers; and 12 Wisconsin-Michigan boundary waters.

Muskellunge Fishing Tournaments. The number of permitted muskellunge fishing tournaments has averaged 55 per year since 1994 (the first full year of the mandatory permit system). The number of permitted tournaments has generally declined from 1994 to present, but there was an increase in permits for 2001.



During 2001, new standardized statewide guidelines were developed for muskellunge fishing tournaments. A group of fisheries biologists developed the guidelines, which were approved by the Fisheries and Habitat Board for inclusion in the Fish Management Handbook (Appendix 3).

Catch of trophy muskellunge. We have established a baseline with which to evaluate trends in the catches of "trophy" muskellunge in Wisconsin. Muskies, Inc., has provided access to its membership's catch records. We compiled the number of trophy muskellunge (48" and larger and 50" and larger) reported from Wisconsin waters annually from 1970 to present. After an initial increase in catches (probably due to increasing membership and increased reporting) the numbers over the last 13 years have been relatively stable and averaged 29 (48" and larger) and 9 (50" and larger). Tracking this index will allow us to evaluate the catches of trophy fish in the future and provides a yardstick with which to measure our performance at increasing the catch of trophy muskellunge.



Consumption Advisories – In 2002, muskellunge were added to the statewide consumption guidance for mercury. Nursing women, women who intend to have children, and children under 15 years of age are advised not to eat muskellunge. Women not intending to have children and all men are advised to eat no more than 1 meal per week. The mercury level for all muskellunge sampled averaged 0.70 ug/g; muskellunge 40" and larger averaged 1.08 ug/g mercury.

Habitat Management - A checklist of guidelines intended for lakeshore property owners interested in voluntarily improving habitat for muskellunge on their shorelines has been developed (Appendix 4). It includes specific activities that can be completed on the property owner's shore and broader lake-wide activities that can benefit muskellunge.

Muskellunge Monitoring - There are three elements of our muskellunge monitoring strategy. First, we conduct angler surveys, with periodic mail surveys (about every 10 years) and annual creel surveys, which involves angler interviews at boat landings (about 20 lakes each year; results presented above). Second, we have established a network of 55 long-term trend lakes, where we conduct adult population estimates every 8 to 10 years. Third, we have implemented a Baseline Monitoring program, where we conduct fall electrofishing surveys (including young-of-year recruitment estimates) on every muskellunge lake in the state 100 acres and larger (with public access) once every 6 years. This information will be used to evaluate size limits and stocking practices and to track changes in muskellunge populations through time.

Information and Education. A musky angler survey was initiated during 1999 by Research Scientist, Terry Margenau. The survey essentially repeated the 1989 survey conducted by

Terry and will provide updated information and trends in angler opinion. Questionnaires were sent out during spring 2000 and the results are currently being analyzed.

A recent graduate thesis project examined the food habitats of Wisconsin muskellunge (Burrie 1997). Thirty-four muskellunge lakes were sampled over a 4-year period, with 1,092 muskellunge (8 to 46 inches in length) examined. Fish comprised 98% of the diet. Yellow perch (30%) and white sucker (8.4%) were the major prey items; minnows and panfish were also important. Bass and walleye were relatively unimportant. Only 6 walleye (0.9% of the diet items; 0.5% of muskellunge sampled) and 17 bass (2.9% of the diet items; 1.6% of muskellunge sampled) were found in all the samples.

A “Fish Wisconsin Muskellunge” home page has been established on the Wisconsin Department of Natural Resources Web Site (http://www.dnr.state.wi.us/org/water/fhp/fish/musky/index.htm). The web page contains a variety of musky fishing resources.

Appendix Table 1. Statewide Muskellunge Stocking Plan.

County	Waterbody	Acres	Class	Cat	Rate (#/acre)	Size*	Year (Tier 1/ Tiers 2&3)	Number to be Stocked			
								Tier 1	Tier 2	Tier 3	Total
ADAMS	CASTLE ROCK	13955	C	3	0.5	Large	Every/Odd	2,500	2,500	2,500	7,500
ADAMS	PETENWELL	23040	B	3	0.3	Large	Every/Even	2,500	2,500	2,500	7,500
ASHLAND	EF Chippewa River	351	B	2	1	Large	Even	351	0	0	351
BARRON	Big Moon	191	C	3	1	Large	Even	191	0	0	191
BARRON	RICE	939	A2	3	1	Large	Odd	939	0	0	939
BARRON	Sand (Big)	322	B	3	1	Large	Even	322	0	0	322
BAYFIELD	MIDDLE EAU CLAIRE	902	A1	3	2	Large	Even	1,804	0	0	1,804
BAYFIELD	NAMEKAGON	3227	A1	2	1	Large	Odd	2,500	727	0	3,227
BAYFIELD	Pike Chain	945	A1	2	1	Large	Even	945	0	0	945
BAYFIELD	UPPER EAU CLAIRE	996	B	3	0.5	Large	Even	498	0	0	498
BURNETT	Benoit	279	C	3	0.5	Large	Sporadic	0	0	140	140
BURNETT	BIG MCKENZIE	1185	B	3	1	Large	Odd	1,185	0	0	1,185
BURNETT	Des Moines	229	C	2	1	Large	Sporadic	0	0	229	229
BURNETT	Lipsett	393	C	3	0.5	Large	Sporadic	0	0	200	200
BURNETT	Namekagon River		C	2	1	Large	Sporadic	0	0	200	200
BURNETT	RICE	326	C	3	1	Large	Even	326	0	0	326
BURNETT	St. Croix River		C	2	1	Large	Sporadic	0	0	700	700
BURNETT	TRADE	434	C	3	0.5	Large	Even	217	0	0	217
BURNETT	TWENTY SIX	230	B	3	1	Large	Odd	230	0	0	230
BURNETT	YELLOW, L YELLOW, DANBURY	2891	A2	3	0.5	Large	Even	1,445	0	0	1,445
CHIPPEWA	Cornell Flowage	836	B	2	2	Large	Even	1,672	0	0	1,672
CHIPPEWA	HOLCOMBE	3890	A1	2	2	Large	Every/Odd	2,500	2,500	2,500	7,500
CHIPPEWA	LONG	1060	B	2	2	Large	Odd	2,120	0	0	2,120
CHIPPEWA	Old Abe Lake	996	B	2	2	Large	Even	1,992	0	0	1,992
CHIPPEWA	Round Lake	216	C	0	2	Large	Even	432	0	0	432
CHIPPEWA	Sand Lake	262	B	2	2	Large	Even	524	0	0	524
CHIPPEWA	WISSOTA	6300	A1	2		Yearling	Every	100	0	0	100
CHIPPEWA	WISSOTA	6300	A1	2	2	Large	Every/Odd	2,500	2,500	2,500	7,500
CLARK	BLACK R	1561	B	3	1	Large	Even	2,500	0	0	2,500
CLARK	MEAD	320	B	3	2	Large	Every	640	0	0	640
COLUMBIA	Lake Wisconsin	9000	C	3	1	Large	Even	2,500	2,500	2,500	7,500
COLUMBIA	PARK	312	C	3	0.5	Large	Odd	156	0	0	156
COLUMBIA	SILVER	74	C	3	1	Large	Every	100	0	0	100
COLUMBIA	SILVER	74	C	3	1	Yearling	Every	100	0	0	100
COLUMBIA	SWAN	406	C	3	1	Large	Every	270	0	0	270
COLUMBIA	SWAN	406	C	3	1	Yearling	Every	270	0	0	270
DANE	MONONA	3274	B	3	1	Large	Every/Odd	2,500	2,500	1,548	6,548
DANE	WAUBESA	2080	B	3	1	Large	Every/Even	2,500	1,660	0	4,160
DANE	WINGRA	345	B	3	1	Large	Every	345	0	0	345
DODGE	FOX	2625	C	3	1	Large	Odd	2,500	125	0	2,625
DOUGLAS	LOWER EAU CLAIRE	802	B	3	0.5	Large	Even	401	0	0	401
DOUGLAS	St. Croix Flowage	1913	C	0	1	Large	Even	1,913	0	0	1,913
DOUGLAS	ST. LOUIS RIVER	12000	A1	2	0.5	Large	Even	2,500	2,500	1,000	6,000
EAU CLAIRE	ALTOONA	840	B	0	2	Large	Odd	1,680	0	0	1,680
EAU CLAIRE	Dells Pond	739	B	2	2	Large	Even	1,478	0	0	1,478
EAU CLAIRE	LAKE EAU CLAIRE	1118	B	0	2	Large	Odd	2,236	0	0	2,236
FOREST	SILVER	320	B	3	1	Large	Odd	320	0	0	320
FOREST	Wabikon & Riley	807	A2	2	1	Large	Even	807	0	0	807

FOREST	WINDFALL	55	B	3	1	Large	Odd	55	0	0	55
GREEN LAKE	LITTLE GREEN	466	A1	3	2	Large	Even	932	0	0	932
IOWA	TWIN VALLEY	152	A2	3	1	Large	Every	150	0	0	150
IRON	GILE FLOWAGE	3384	A1	2	1	Large	Even	2,500	884	0	3,384
IRON	ISLAND LAKE (new 2003)	352	A1	3	0.5	Large	Odd	176	0	0	176
IRON	Randall	115	C	3	0.5	Large	Even	57	0	0	57
IRON	TRUDE	781	A1	3	0.5	Large	Odd	390	0	0	390
IRON	TURTLE FLAMBEAU FL	13545	A1	3	0.5	Large	Odd	2,500	2,500	1,772	6,772
JACKSON	BLACK R	1372	B	3	1	Large	Odd	1,372	0	0	1,372
JACKSON	BLACK R-ARBUTUS CNL		B	3		Small	Odd	395	0	0	395
JACKSON	POTTERS FL	347	B	3	2	Large	Odd	694	0	0	694
JEFFERSON	KOSHKONONG	10460	B	3	0.5	Large	Every/Even	2,500	2,500	230	5,230
KENOSHA	SILVER	464	B	3	2	Large	Every	928	0	0	928
LAFAYETTE	YELLOWSTONE	455	A1	3	2	Large	Odd	910	0	0	910
LANGLADE	Deepwoods	63	B	3	0.5	Large	Even	32	0	0	32
LANGLADE	ENTERPRISE	505	A2	2	1	Large	Odd	505	0	0	505
LANGLADE	Greater Bass	258	B	3	0.5	Large	Odd	129	0	0	129
LANGLADE	MOCCASIN	110	B	2	1	Large	Odd	110	0	0	110
LANGLADE	Summit	282	B	2	0.5	Large	Even	141	0	0	141
LANGLADE	Waterpower	22	B	3	0.5	Large	Odd	11	0	0	11
LINCOLN	Mohawksin	1910	B	2	0.5	Large	Even	955	0	0	955
LINCOLN	SOMO	472	B	2	1	Large	Odd	472	0	0	472
LINCOLN	Squaw	79	B	3	0.5	Large	Even	40	0	0	40
MARATHON	BIG EAU PLEINE RIVER		B	3		Large	Even	500	0	0	500
MARATHON	BIG RIB RIVER	81	B	3	2	Large	Odd	300	0	0	300
MARATHON	MISSION	107	B	2	2	Large	Odd	214	0	0	214
MARINETTE	CAULDRON FALLS	1018	A2	2	1	Large	Every	1,000	0	0	1,000
MARINETTE	NOQUEBAY	2409	C	3	1	Large	Every	1,000	0	0	1,000
ONEIDA	BOOTH	207	A2	2	0.5	Large	Odd	103	0	0	103
ONEIDA	BUCKSKIN	634	B	2	0.5	Large	Odd	317	0	0	317
ONEIDA	George	435	A2	2	0.5	Large	Even	217	0	0	217
ONEIDA	Gilmore	301	A2	2	0.5	Large	Even	150	0	0	150
ONEIDA	JULIA	401	A2	2	1	Large	Odd	401	0	0	401
ONEIDA	LOWER KAUBASHINE	187	A2	2	0.5	Large	Even	93	0	0	93
ONEIDA	SQUIRREL	1317	A2	2	0.5	Large	Odd	658	0	0	658
ONEIDA	Sugar Camp Chain	1503	A2	2	0.5	Large	Even	751	0	0	751
ONEIDA	SWEENEY	187	A2	2	1	Large	Odd	187	0	0	187
ONEIDA	Three Lakes Chain	3341	A2	2	0.5	Large	Even	1,670	0	0	1,670
POLK	Apple River Flowage	639	B	3	1	Large	Even	639	0	0	639
POLK	BONE	1781	A2	3	2	Large	Odd	2,500	1,062	0	3,562
POLK	DEER	807	A2	3	2	Large	Even	1,614	0	0	1,614
PORTAGE	Stevens Point Flowage	2093	B	3	0.5	Large	Even	1,047	0	0	1,047
PRICE	BIG DARDIS	144	A2	2	0.5	Large	Odd	72	0	0	72
PRICE	DEER	145	A2	2	0.5	Large	Even	72	0	0	72
PRICE	GRASSY	80	A2	2	1	Large	Even	80	0	0	80
PRICE	LAC SAULT DORE (Soo)	561	A2	2	0.5	Large	Odd	280	0	0	280
PRICE	MUSSER	563	A2	2	0.5	Large	Odd	281	0	0	281
PRICE	NORTH SPIRIT	213	A2	2	0.5	Large	Odd	106	0	0	106
PRICE	Phillips Chain (Elk, Long, Duroy, Wilson)	1236	A2	2	1	Large	Odd	1,236	0	0	1,236
PRICE	PIKE CHAIN (Pike, Round, Turner)	1681	A2	2	0.5	Large	Odd	840	0	0	840
PRICE	SF FLAMBEAU RIVER	360	B	2	0.5	Large	Odd	180	0	0	180

RUSK	Amacoy	278	A2	3	1	Large	Odd	278	0	0	278
RUSK	AUDIE	128	B	3	0.5	Large	Odd	64	0	0	64
RUSK	Chain	468	A2	3	1	Large	Even	468	0	0	468
RUSK	CHIPPEWA RIVER	1100	B	3	1	Large	Even	1,100	0	0	1,100
RUSK	DAIRYLAND (changed from 1 to 0.5/acre in 2003)	1745	A1	2	0.5	Large	Odd	873	0	0	873
RUSK	LADYSMITH (new in 2003)	288	A1	2	0.5	Large	Odd	144	0	0	144
RUSK	POTATO	534	A1	3	0.5	Large	Odd	267	0	0	267
RUSK	THORNAPPLE (new 2003)	268	A2	2	0.5	Large	Odd	268			268
SAUK	REDSTONE	612	B	3	2	Large	Odd	1,224	0	0	1,224
SAWYER	BARBER	238	A2	2	1	Large	Odd	238	0	0	238
SAWYER	BEVERLY	16	B	3	0.5	Large	Even	8	0	0	8
SAWYER	CHIPPEWA FLOWAGE	15300	A1	2	0.5	Large	Odd	2,500	2,500	2,650	7,650
SAWYER	Chippewa River	586	B	2	0.5	Large	Even	293	0	0	293
SAWYER	CHIPPEWA RIVER - RADISSON	841	B	2	1	Large	Even	841	0	0	841
SAWYER	Connors	429	B	2	1	Large	Even	429	0	0	429
SAWYER	FLAMBEAU RIVER	630	B	2	1	Large	Odd	630	0	0	630
SAWYER	GRINDSTONE	3011	A1	3	1	Large	Odd	2,500	511	0	3,011
SAWYER	Hayward	247	A2	2	1	Large	Even	247	0	0	247
SAWYER	LAC COURTE OREILLES	5039	A1	3	0.5	Large	Odd	2,500	19	0	2,519
SAWYER	LAKE OF THE PINES	273	A2	2	1	Large	Odd	273	0	0	273
SAWYER	LORETTA	126	A2	2	0.5	Large	Odd	63	0	0	63
SAWYER	LOST LAND	1304	A2	2	0.5	Large	Odd	652	0	0	652
SAWYER	ROUND	3054	A1	3	0.5	Large	Even	1,527	0	0	1,527
SAWYER	SAND (changed from 1 to 0.5 in 2003)	928	A2	2	0.5	Large	Odd	464	0	0	464
SAWYER	SISSABAGAMA	719	A2	2	0.5	Large	Odd	359	0	0	359
SAWYER	TEAL	1124	A2	2	0.5	Large	Odd	562	0	0	562
SAWYER	WHITEFISH	786	A1	3	1	Large	Even	786	0	0	786
SAWYER	WINTER	676	A1	2	1	Large	Odd	676	0	0	676
SHAWANO	Cloverleaf lakes (Pine, Grass, Round)	320	B	3	2	Large	Even	640	0	0	640
SHAWANO	SHAWANO	6063	B	3	1	Large	Every/Even	2,500	2,500	1,063	6,063
SHAWANO	UPPER RED	188	B	0	2	Large	Odd	376	0	0	376
SHEBOYGAN	RANDOM	209	B	3	2	Large	Odd	418	0	0	418
ST CROIX	CEDAR	1107	B	3	1	Large	Odd	1,107	0	0	1,107
TAYLOR	JUMP RIVER	270	C	2	1	Large	Odd	270	0	0	270
TAYLOR	RIB (added in 2002)	320	A2	2	0.5	Large	Even	160	0	0	160
VARIOUS	GREEN BAY (Various locations)		C	0		Large	Every	6,600	0	0	6,600
VARIOUS	GREEN BAY (Various locations)		C	0		Yearling	Every	400	0	0	400
VILAS	Alma/Moon	189	A2	3	0.5	Large	Even	94	0	0	94
VILAS	ARROWHEAD	99	A2	3	0.5	Large	Odd	49	0	0	49
VILAS	BIG (changed to 0 in 2003)	771	A1	2	0	Large	Odd	0	0	0	0
VILAS	Big Arbor Vitae	1090	A2	2	1	Large	Even	1,090	0	0	1,090
VILAS	BIG MUSKELLUNGE	930	A1	2	0.5	Large	Odd	465	0	0	465
VILAS	BIG ST GERMAIN	1617	A1	2	0.5	Large	Odd	808	0	0	808
VILAS	Brandy	110	B	2	1	Large	Even	110	0	0	110
VILAS	BUCKATABON, Upper and Lower	846	A1	2	0.5	Large	Odd	423	0	0	423
VILAS	Crab	949	A1	2	0.5	Large	Even	474	0	0	474
VILAS	DEERSKIN	309	A2	3	1	Large	Odd	309	0	0	309

VILAS	Eagle Chain	3334	A2	2	0.5	Large	Even	1,667	0	0	1,667
VILAS	High/Fishtrap	1063	A2	2	0.5	Large	Even	531	0	0	531
VILAS	JOHNSON	78	A2	2	1	Large	Odd	78	0	0	78
VILAS	LAC VIEUX DESERT	4300	A2	2	0.5	Large	Odd	2,150	0	0	2,150
VILAS	Laura	599	A1	2	0.5	Large	Even	299	0	0	299
VILAS	LITTLE ARBOR VITAE	534	A2	2	0.5	Large	Odd	267	0	0	267
VILAS	Little Spider	235	B	3	1	Large	Even	235	0	0	235
VILAS	Little St. Germain	980	A2	2	0.5	Large	Even	490	0	0	490
VILAS	LOST	544	A2	2	1	Large	Odd	544	0	0	544
VILAS	LOWER GRESHAM (changed to 0 in 2003)	149	B	2	0	Large	Odd	0	0	0	0
VILAS	Lynx	339	A2	2	1	Large	Even	339	0	0	339
VILAS	Manitowish Chain	3607	A1	2	0.5	Large	Even	1,803	0	0	1,803
VILAS	Oswego	66	C	2	0.5	Large	Even	33	0	0	33
VILAS	PALMER	635	A1	2	0.5	Large	Odd	317	0	0	317
VILAS	Papoose	428	A1	2	1	Large	Even	428	0	0	428
VILAS	Pickerel	293	A2	2	0.5	Large	Even	146	0	0	146
VILAS	PRESQUE ISLE	1280	A1	2	0.5	Large	Odd	640	0	0	640
VILAS	ROUND	116	A2	2	0.5	Large	Odd	58	0	0	58
VILAS	SQUAW	785	A2	2	1	Large	Odd	785	0	0	785
VILAS	STAR	1206	A1	2	1	Large	Odd	1,206	0	0	1,206
VILAS	TROUT (added in 2003 - 2002 adult PE 0.05/acre)	3816	A1	2	1	Large	Odd	3,816	0	0	3,816
VILAS	UPPER GRESHAM	366	A2	2	1	Large	Odd	366	0	0	366
VILAS	VERNA	77	B	3	1	Large	Odd	77	0	0	77
VILAS	WHITE SAND	734	A1	2	1	Large	Even	734	0	0	734
WALWORTH	DELAVAN	2072	C	3	2	Large	Every/Odd	2,500	1,644	0	4,144
WASHBURN	Leisure	75	C	3	1	Large	Sporadic	0	0	75	75
WASHBURN	MATTHEWS	263	B	3	1	Large	Odd	263	0	0	263
WASHBURN	Namekagon River		C	2	1	Large	Sporadic	0	0	200	200
WASHBURN	Shell	2580	A1	3	0.5	Large	Even	1,290	0	0	1,290
WASHBURN	Trego Flowage	451	B	3	0.5	Large	Even	225	0	0	225
WASHBURN	Yellow River		C	3	1	Large	Sporadic	0	0	200	200
WAUKESHA	OKAUCHEE	1187	B	3	2	Large	Every	2,374	0	0	2,374
WAUKESHA	PEWAUKEE	2493	A2	3	2	Large	Every/Even	2,500	2,486	0	4,986
WINNEBAGO	Winnebago system	168000	C	1		Small	Every	5,000	0	0	5,000
WOOD	WISCONSIN R	567	B	3	2	Large	Odd	2,000	0	0	2,000
					Totals	Small	Odd	7,895	2,500	230	10,625
							Even	5,000	0	0	5,000
						Large	Odd	94,748	28,234	18,977	141,959
							Even	89,202	29,174	18,285	136,661
						Yearling	Odd	870	0	0	870
							Even	870	0	0	870

Appendix 2. Category 1 and 2 muskellunge waters where stocking has been suspended for up to 10 years. The waters will be monitored and stocking will resume if continued natural reproduction is not documented. REGION=DNR administrative unit; NOR is Northern Region. WATERBODY is the name of the lake or river. CLASS is the type of muskellunge fishery; CATEGORY is the reproductive status of the population.

REGION	WATERBODY (lake, unless indicated)	COUNTY	ACRES	CLASS	CATEGORY
NOR	*Bass/Patterson	Washburn	188	B	1
NOR	*Black	SAWYER	129	A2	1
NOR	*Black Dan	SAWYER	128	B	2
NOR	*Deep	Washburn	43	C	1
NOR	*Des Moines (Sucker)	BURNETT	229	C	2
NOR	*ECHO	IRON	220	A2	2
NOR	*EF CHIPPEWA RIVER (Blaisdell, Hunter, Barker)	SAWYER	804	A2	2
NOR	*Fishtrap	SAWYER	216	A2	2
NOR	*FLAMBEAU RIVER (Big Falls)	RUSK	1240	A2	2
NOR	*Ghost	SAWYER	372	A2	2
NOR	*Island	SAWYER	67	B	2
NOR	*Lower Clam	SAWYER	229	A2	1
NOR	*Nancy	Washburn	772	C	1
NOR	*TOMAHAWK Chain	ONEIDA	3392	A2	2
NOR	AMNICON	DOUGLAS	426	A2	2
NOR	BALLARD/IRVING/WBIRCH	VILAS	1025	A2	2
NOR	Big Sand	Vilas	1408	A1	2
NOR	Boot	Vilas	284	A1	2
NOR	BOULDER	VILAS	524	A2	2
NOR	BUTTERNUT	PRICE	1006	A2	2
NOR	Carrol	Oneida	352	A2	2
NOR	Crescent	Oneida	626	A2	2
NOR	Diamond	Oneida	124	A2	2
NOR	FOUND	VILAS	326	A2	2
NOR	JULIA	ONEIDA	238	B	2
NOR	LITTLE CROOKED	VILAS	153	A2	2
NOR	LITTLE JOHN	VILAS	166	A2	2
NOR	LITTLE TAMARACK FL	VILAS	200	C	2
NOR	LYMAN	DOUGLAS	403	A2	2
NOR	MUSKELLUNGE	ONEIDA	284	A2	2
NOR	MUSKELLUNGE	VILAS	272	A2	2
NOR	PELICAN	ONEIDA	3585	A2	2
NOR	PLUM	VILAS	1108	A1	2
NOR	Rhinelander/Boom	Oneida	1763	A1	2
NOR	Rice River System (Nokomis)	Lincoln	3920	A2	2
NOR	SOLBERG	PRICE	859	A2	2
NOR	Spirit Lake	Taylor	126	B	2
NOR	STELLA	ONEIDA	405	B	2
NOR	STELLA	VILAS	91	B	2
~~NOR~~	~~Trout* (added to 2003 quotas at 1/acre)~~	~~Vilas~~	~~3816~~	~~A1~~	~~2~~
NOR	Turtle, North & South	Vilas	823	A2	2
NOR	UPPER PARK FALLS FL	PRICE	431	A2	2
NOR	WEST HORSEHEAD	ONEIDA	145	A2	2

*=Waters where the Fisheries Biologist has elected to suspend stocking, regardless of whether or not the new stocking framework would have been implemented.

Appendix 3. Muskellunge Fishing Tournament Guidelines.

Fish Management Handbook (10-3-01) p.44-20 HB36059.44_20

Specific Permit Conditions for Catch and Release Muskellunge Fishing Tournaments

Applicability - The following conditions apply to muskellunge tournaments that require a fishing tournament permit under s. NR 20.40, Wis. Adm. Code.

Background - The number of muskellunge angling tournaments in Wisconsin is increasing. For most of these tournaments, the intent is to release muskellunge alive. The Department supports that goal and discourages "catch-and-kill" tournaments.

However, there is currently substantial inconsistency in the rules and procedures required by sponsors of “live-release” tournaments. Further, considerable disagreement exists among the angling public, organized muskellunge angling groups, and tournament sponsors regarding how best to handle muskellunge in order to maximize survival when the ultimate intent is live-release.

The following conditions were developed to address this issue. These guidelines should be applied consistently for all permitted muskellunge tournaments, unless unusual or special circumstances dictate otherwise. Additional conditions relating to the methods of fish holding, transport, or release may also be required, depending upon specific circumstances, as determined by the fisheries biologist issuing the permit.

The guidelines were developed primarily to address biological issues aimed at maximizing survival of muskellunge following release and are applicable to all environmental conditions typically found throughout the open angling season.

Guidelines for “Catch and Release” Tournaments

A. **Recommended “Immediate-Release” Format** - All fishing tournaments for which muskellunge is a listed species should, whenever possible, be "immediate release" for muskellunge. Available technologies, such as cellular phones and digital cameras, make “immediate-release”. a viable option under most circumstances. All “immediate-release” tournaments (where muskellunge are caught, immediately registered on the water, and released) must meet the following conditions:
1. Participants must possess a “cradle” or landing net of sufficient size to allow a muskellunge to remain upright in the water at boat side.
2. When a muskellunge is caught, the boat can not be moved under power except within the immediate vicinity of the capture site to avoid eminent danger and to facilitate a quick and safe release of the fish. If the boat is moved for greater distances or for other purposes, the fish must be counted towards the angler’s daily bag limit, pursuant to s. NR 20.05(7), Wis. Adm. Code.
3. The muskellunge must be held in a net in the water at boat-side and should not be boated except as absolutely necessary to remove hooks or to avoid eminent danger as described in 2. Tournament sponsors should consider recommending the use of barbless hooks to expedite the release process.
4. Upon landing a muskellunge, the angler must immediately initiate the official tournament registration process.
5. Any angler who catches a muskellunge may not resume fishing until the fish has been successfully released. Registration of fish is restricted to the measurement of length (no weighing, fin clipping, tagging or other marking unless part of an approved DNR study). In-water measurement of the fish is recommended when ever possible.
6. The muskellunge should be released immediately following registration or when it is capable of swimming upright under its own power.

B. **Alternate “Live-Release” Format -** If the conditions in A above will not be met, or where the intent is to transport, register, and release the fish alive, for muskellunge fishing tournaments, the following conditions apply:
1. All transported fish must be of legal size for that water body.
2. All participants should use boats equipped with a live well or other container of at least 45ls in length (inside measurement**).**
3. Each participant’s live well or other container should be equipped with a pump for aerating and exchanging fresh water that is operated continuously once a fish is placed in the live well or other container.
4. Participants must immediately transport muskellunge placed in a live well or other container to the designated registration site.
5. Tournament officials should immediately register muskellunge brought to the point of registration. No pens, tanks or other means of confinement may be used at the point of registration.

6. Public boat landings should not be used as registration sites or tournament headquarters.
7. Registration of muskellunge is restricted to a measurement of length only (no weighing, fin clipping, tagging or other marking unless part of an approved DNR study). In-water measurement of the fish is recommended when ever possible.
8. Muskellunge that are transported to a registration site must be counted towards the participant's daily bag limit, and that person may not fish for muskellunge during the remainder of that day.
9. A fish should be retained only until capable of swimming upright under its own power and should be released from the point of registration; no further transport of the fish is permitted.
10. The participant may not leave the registration point until the fish has been successfully released. If the fish can not be released alive, final disposition of the fish is the responsibility of the participant.
11. If high water temperature or excessive wave action during a tournament are likely to contribute to excessive mortality (either initial or delayed), transport and subsequent release of muskellunge could constitute a malicious waste of the resource under s. 29.095(1), Wis. Stats. Therefore, until the day prior to the start of the tournament, the Department reserves its authority under s. NR 20.40(6)(c)3., to require that transported muskellunge be kept and not released.

C. **All Other Formats** - If the conditions in A or B above, cannot be met, the Department reserves its authority pursuant to s. NR 20.40(6)(c)3., to require that muskellunge be kept and NOT released.

Appendix 4. Lake Habitat Restoration and Management Guidelines

GREAT HABITAT – GREAT FISHING!

Lake Habitat Restoration and Management - These guidelines are meant for lake-property owners interested in voluntarily improving habitat for muskellunge on their shorelines. They are not meant to address serious problems with erosion or run-off.

SITE SPECIFIC ACTIVITIES

PLANNING.

Sketch the property and show the location of anticipated restoration activities.

Document the site before and after with photographs.

Check with your local Water Management Specialist and Fisheries Biologist for permits needed on a site-specific basis. Proposals may be subject to Chapter 30, Wis. Stats.

BUFFER ZONE

Flag the shoreland within at least 35 feet of the water's edge for protection - no mowing or brushing should take place, except to maintain a path to a dock or for a viewing corridor (< 30 feet wide). In the long-term, cedar, white pine, or eastern hemlock are the best riparian tree species for muskellunge.

BANK

Remove rip-rap, sea walls, or other artificial erosion control structures. These can impact aquatic plants through wave action and reduce or eliminate near-shore habitat.

Slope the banks, if needed (when removing sea-walls or rip rap). Allow natural shoreline plants to grow. Planting may be needed (guides are available from your Water Management Specialist).

Protect the bank if it is bare. Brush bundles can be staked into the bank to protect raw areas. Use readily sprouting species such as alder, dogwood, or willow (except weeping willow). Also, sedges can be planted.

Install temporary wave breakers, especially in high-energy areas, until plants have become established. Brush bundles staked to the bottom in 3 to 5 feet of water are effective temporary wave breakers and also serve as habitat for aquatic organisms. Bulrushes can be planted between the land and the wave breakers in areas with firm bottoms (consult an expert). Cattails or arrowhead are desirable in soft-bottom areas.

AQUATIC PLANTS

Leave aquatic plants along the shoreline. Muskellunge spawn on aquatic plants. Manually remove (by raking) only enough plants to allow boat access to your dock. If you already have a sandy beach, consider reducing its size to allow for natural shoreland and underwater plants to be reestablished. If aquatic plants are not present, consider plantings to speed up the restoration. Again, bulrushes are ideal for near-shore areas with firm bottoms (restoration can be difficult; consult an expert).

Install temporary wave breakers. These will reduce wave action and hasten reestablishment of aquatic plants. Wild Celery (Vallisneria), bulrushes, coontail, and native (not eurasian) milfoil are known to be important for muskellunge nursery areas. Chara is also a documented spawning substrate for muskellunge.

WOODY COVER. Wood particles are important for muskellunge spawning and the structural elements of trees and bushes provide cover for young muskellunge and their food.

Tree drops should be live trees with a minimum diameter of 12" at the base. Trees should not be entirely severed at the base – this will help anchor the tree to shore. If this is not possible (e.g., trees are brought in from other areas), the base should be anchored to shore with a cable fastened to the stump, a nearby tree, other secure object, or a "dead man" driven into the bank. Tree drops within 100 feet of shore generally do not need to be marked as navigation hazards because they are within the "slow-no-wake" zone. However, the need for marking should be determined on a case-by-case basis during the planning phase. One fallen tree for every five feet of shoreline is the ultimate goal (this is the frequency of fallen trees in undeveloped Wisconsin lakes). A combination of cedar, pine, and aspen or birch will provide cover for many years. Pine and cedar are long lasting; aspen and birch provide good cover and break down quickly into woody fragments that can improve muskellunge spawning.

Secure old Christmas trees under piers to provide shelter for young muskellunge. Plant cover is usually lost due to the shading effects of docks. Half-logs in about 3 feet of water provide nest sites for bass.

Lake-wide Activities

Identify Sensitive Areas – Cruise shorelines and identify areas with ideal muskellunge habitat (spawning areas, nursery areas, or rare/unique adult habitat). Mark them on maps and share them with local Fisheries Biologists and Water Management Specialists. They can conduct "Sensitive Area Designations" and flag them for protection in the event of future permit applications to alter the habitat.

Identify existing spawning areas (spot light surveys) – Cruise the shorelines at night during the spawning period (50-60 F). Spotlights will pick up reflections from muskellunge eyes. Record the number and location of muskellunge seen during this time period (along with the areas and times surveyed). At this time of the year, fish are located in spawning areas, AND night-time fish counts are directly related to population abundance, so trends in these counts over time can be used to track changes in adult abundance.

Develop a "Demonstration Area" to showcase shoreline restoration and use it to educate other lake shore property owners. Work with other interested lake shore property owners adjacent to identified muskellunge spawning areas to protect these areas from development, destruction, or alterations.

Monitor dissolved oxygen at dawn in spawning areas if problems with egg/fry survival are suspected,. If it falls below 3.2 ppm, sealing high BOD materials may be needed. Alternatively, use water-level management, where possible, for over-winter drawdown to compact and aerate bottom sediments in spawning areas. This, however, can result in freeze-out of aquatic plants during harsh winters.

Work with local units of government to develop boating ordinances ("slow-no-wake", etc.) to protect sensitive or critical habitats if boat traffic is a concern.

Useful Background/Reference Materials: The Department of Natural Resources and the University of Wisconsin-Cooperative Extension Service offer a variety of resources and materials to help lakefront property owners plan restoration projects and improve the habitat along a waterfront. Contact your local DNR service center to request information. DNR Water Management Specialists will explain the rules and describe how property owners can design their project to meet personal and environmental concerns and possibly avoid the need for a permit. For further information check the DNR Waterfront page (www.dnr.state.wi.us/org/water/fhp/waterfront.htm) or the UW-Extension clean water web site (http://clean-water.uwex.edu/).

Lakescaping for Wildlife and Water Quality (180 pages, $19.95, available from the Minnesota Bookstore at 1-800-657-3757). Wisconsin DNR staff recommend this book as a detailed planning guide for shoreland restoration in Wisconsin.

The Living Shore, a 17-minute video produced by UW-Extension and University of Minnesota Extension showing the importance of leaving a natural 'buffer zone' between the lake and lake owners' dwellings, and providing information about selecting and planting shoreline plants. Call the Wisconsin Association of Lakes (1-800-542-LAKE) to order a copy for $15 plus $2 in shipping, or check your local library for a copy.

A Fresh Look at Shoreland Restoration, A 4-page pamphlet describing options for restoring shoreland habitat. Available from UW-Extension # GWQ027, or the DNR, publication # DNR-FH-055

What is a shoreland buffer?, A brief ecological and legal overview of shoreland buffers. Available from the UW-Extension, publication #GWQ028 or the DNR, publication # DNR FH-233.

The Water's Edge. A 12- page brochure about what you can do on your lakeshore property to improve habitat for fish and wildlife. Available from your local DNR Service Center.

Life on the Edge... Owning Waterfront Property, UW-Extension. Send $3 per copy plus $1.50 for shipping and handling for a total of $4.50 (make checks payable to UW-Extension) to: UWEX-Lakes Program, College of Natural Resources, University of Wisconsin, 1900 Franklin St. Stevens Point, WI 54481

Compiled by: Tim Simonson, Wisconsin Department of Natural Resources, FH/3, PO BOX 7921, Madison, WI 53707
(608) 266-5222; simont@dnr.state.wi.us.